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THE BASIS OF DAYLIGHTING CALCULATIONS

By WILLIAM ALLEN, B.Arch., A.R.I.B.A.

The basis of daylighting calculation in this country has been established for some time and is well defined. It is founded upon one major assumption, that the sky is a uniformly bright source of light; and though this is never exactly true, it is nearest to being true on those days when it matters most—namely, when the sky is overcast—and calculations thus based give satisfactory results in practice.

No assumption is now made about the intensity of light from the sky, though sometimes reference is made to a value of 500 foot candles as being commonly found out-of-doors. And it follows that if no specific assumption is made about the brightness of the sky, no calculation will normally be made of daylight intensity indoors. Instead we calculate only the proportion of light to be expected on a horizontal plane at any point indoors compared with what would be found outdoors at the same moment under an unobstructed sky, commonly terming this ratio the daylight factor* and expressing it as a percentage. Thus one might refer to a daylight factor of 1 per cent. at some selected reference point indoors, meaning that the illumination there will be 1 per cent. of what would be found under the open sky at that time.

Some people, when making their first calculations on this basis, experience the desire to tie down the daylight factor to an actual intensity. This would seem a natural refinement of the process, and to some extent it can be done now;† but it is not important.

The Process of Making a Daylight Survey in a Room.

Several methods of computing the daylight at a point in a room are available and the more important of these will be discussed here. Reference should be made first, however, to the general way in which a daylight survey in a room is made.

The object is to compute daylight factors at a series of points scattered over the working plane so that a picture of the distribution of daylight in the room can be built up. It is usual to choose the points along a series of lines so that the daylight factors can be set out on a graph in the form of curves representing the changing intensity along each line—a series of cross-sections, as it were. These form an intermediate stage in the survey. The final stage consists of a family of daylight contours, drawn out on the plan with the aid of the daylight curves. This part of the work resembles the drawing of contours on a map from sections taken through the terrain. The daylight contours represent, of course, the lines along which the daylight factor is constant.

Reference to Fig. 1 will help to make this clear. Daylight factor values

* Strictly the "daylight factor" includes the reflected as well as the direct daylight in a room, and the term "sky factor" should be used when, as in the present paper, our concern is with the calulation of direct daylight only. But the daylight factor is the popular term for the purpose and will be used here instead.

† See the "Lighting of Buildings," being the Report of the Building Research Board's Committee on the Lighting of Buildings, issued as No. 12 in the Ministry of Works series of Post-War Building Studies, published by H.M. Stationery Office.

have been determined at several points along a line normal to the centre of the window (" A " on the plan in the figure) and along parallel lines through the reveals of the window (" B "), and also along another parallel line to either side of the window (" C "). Usually in a room such as this, four points along each line will be sufficient, and with these it is possible to set out daylight curves as shown on the cross-section in the figure. In this case, the readings having been taken along lines equally on either side of the centre-line and the

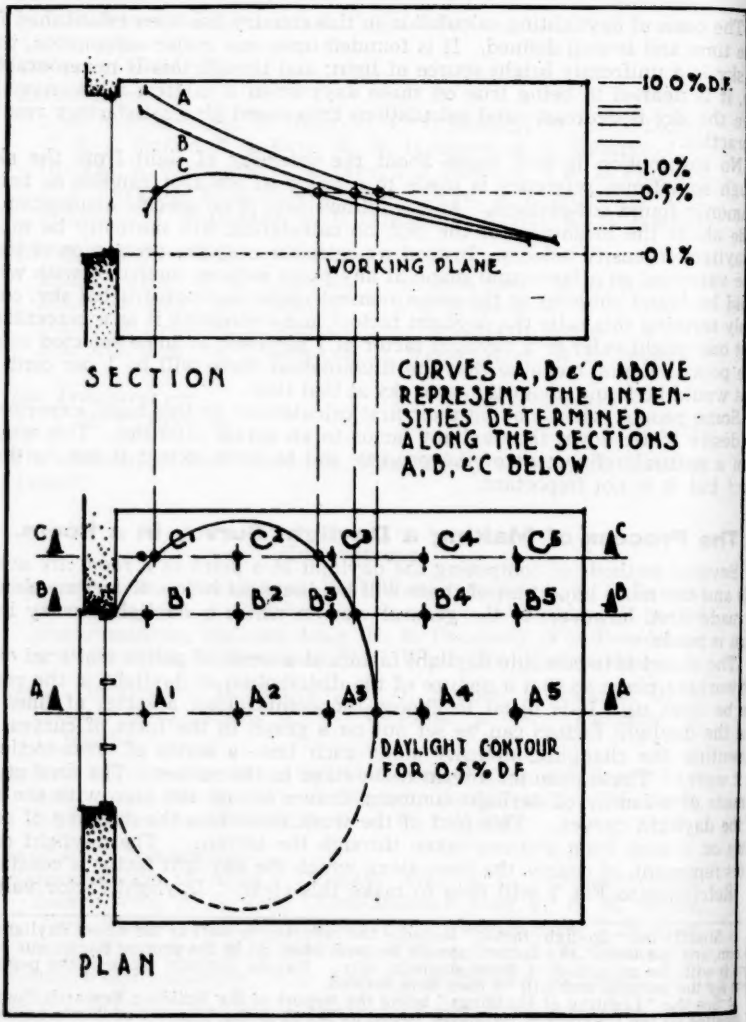

Fig. 1. The elements of a daylight survey.

obstruction being assumed to be symmetrical, the three curves shown represent the daylight values along the five lines. A logarithmic scale is used here in setting out the curves, and is shown at one side of the cross-section. The reason for this will be mentioned later.

Having determined these curves, it is a matter of simple geometry to draw out the contours for any desired daylight factor values. The contour shown in the figure is for a factor of 0.5 per cent.

The working plane, by international agreement, is assumed to be at a level of 2 ft. 9 in. above the floor.

Generally, where the obstruction is more-or-less horizontal, the daylight contour will take the somewhat elliptical shape shown in the figure, and will have a smooth curvature: If a contour, or for that matter the curve on cross-

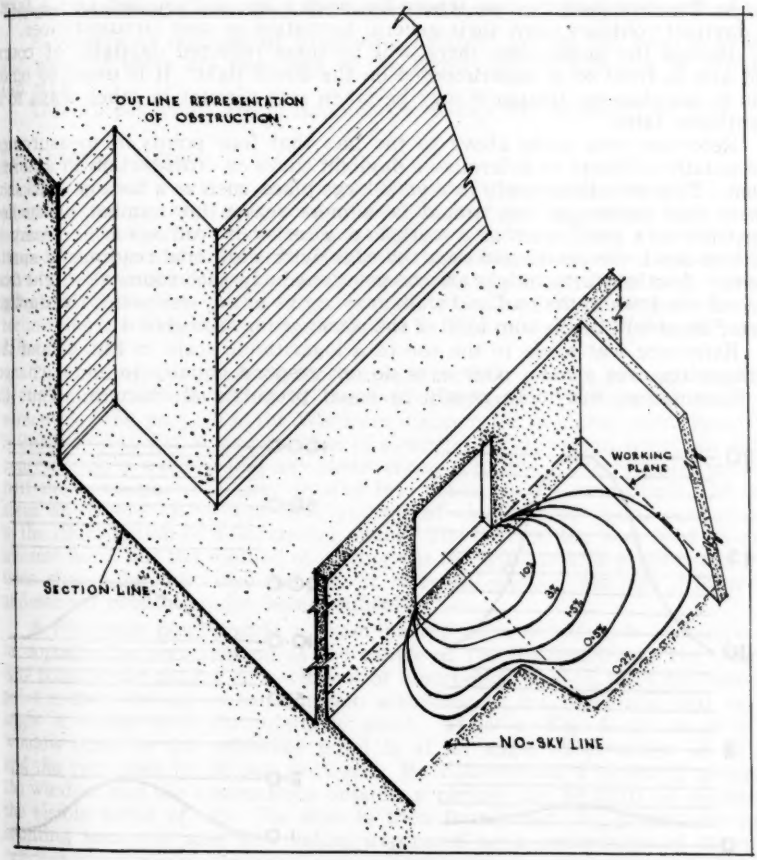

Fig. 2. Showing the no-sky line resulting from an unsymmetrical obstruction, and the corresponding family of daylight contours.

section, displays marked irregularities, these will generally be due to miscalculations, and the smoothness of the curves can be used in this way as a check on the accuracy of the work.

In many circumstances, parts of rooms will receive no direct daylight, i.e. there will be no view of the sky from the working plane at these points. The line along which zero values of direct daylight are found is termed the "no-sky line," and is determined by simple geometrical methods, in which lines are drawn from the profile of an obstruction (usually external) through the head and sides of the window to intersect the working plane, the intersection being the no-sky line. Naturally, where the obstruction is irregular the no-sky line will be similarly irregular, and the daylight contours near the no-sky line will follow its irregularities to some extent, so that the generally ellipsoidal form of the contours will be lost. The smoothness and "logic" of the contours remain, however, as a check on the accuracy of the daylight factor analyses.

In Fig. 2 is shown a case where the no-sky line is irregular, and a family of daylight contours show their general formation in such circumstances.

Behind the no-sky line there will be some reflected daylight, of course, and also in front of it, superimposed on the direct light. It is usual to ignore this in calculations, though it may be taken into account in other ways to be mentioned later.

Reference was made above to the fact that four points of measurement are usually sufficient to determine a daylight curve on cross-section in a normal room. This would not apply in a very large place, such as a factory workshop, where four points per bay would be a more reasonable number on section. Normally in a room, such as a workshop, a series of readings is necessary on sections down the centre and near the edge, with additional readings at special points. Another factor might also be mentioned. In such rooms the light from several windows in the roof and walls may arrive at any one point; the daylight factor there will be the sum total of the readings for each glazed area.

Reference was made to the use of a logarithmic scale in Fig. 1, and this perhaps requires a note. Our eyes do not respond equally to equal changes in illumination, but more nearly to equal proportional changes. Thus the

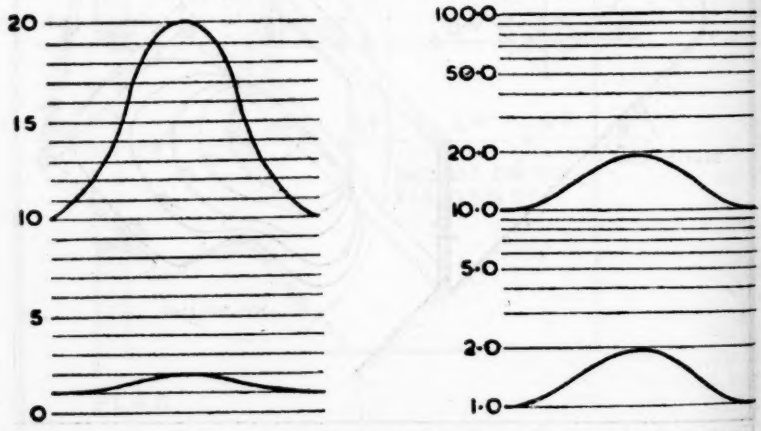

Fig. 3. Comparative curves of illumination intensity set out in arithmetic and logarithmic scales.

difference between one and two foot-candles will seem about equal to the difference between ten and twenty. That being so, the use of an arithmetic scale would produce daylight curves very misleading in appearance, especially when comparisons are made. Thus in Fig. 3 on the left are two curves set out on an arithmetic scale; they appear very different, but to the eye they mean the same thing (except for the difference in general level). If these two curves are set out on a logarithmic scale, as on the right, they appear similar, which is as it should be. Thus a logarithmic scale is always best for lighting work; it helps to keep one from misjudging the distribution of light. Draughtsmen hardly need a reminder that a logarithmic scale can conveniently be set out by using their slide-rules.

There is, of course, no zero on a logarithmic scale; the daylight curve simply turns downwards vertically at that point.

Three Methods for the Determination of Daylight Factors.

A variety of methods of computing daylight factors has been developed, and most of these are described in the Report on the Lighting of Buildings (op. cit.).

Three types which are in common use to-day will be described here.

The Diagram Method.

It was not a widespread practice before the war to make daylighting analyses, though there was more interest in them in this country than in some others because of the existence here of private rights of light which are sometimes the subject of litigation. Naturally the earlier methods of analysis were devised with this in view, the main requirement being accuracy even when the external obstructions were very complicated. The best known of the early techniques are the diagram methods due to P. J. and J. M. Waldram,* and to J. Swarbrick.†

The underlying ideas of the diagram method can be seen quite readily by examining briefly either of the available types. Perhaps the most convenient for the purpose is the Waldram diagram for unglazed conditions. This is illustrated in Fig. 4, and consists of a special reticule upon which an outline representing a window and any obstructions is drawn. The reticule represents half the hemisphere of sky, divided into zones, and is so devised that equal areas anywhere on it represent patches of sky making equal contributions to the illumination of a horizontal plane. The basis of the web is of no direct interest here; but the method of setting out the window and profile of obstructions should be described because it is really simple, but has acquired an undeserved reputation for being difficult.

A reference point inside a room having been selected, it is assumed to lie opposite the zero reading at the centre of the bottom line of the diagram. Any point in the outline of a window or obstruction as seen from the reference point is then set out on the diagram according to the horizontal and vertical angle it makes with the reference point. Thus, in Fig. 4, the head of the window opposite the reference point is at an angle of elevation of 40 deg., and the two sides lie 30 deg. outward. By determining a series of points for the window and the obstructions outside, a picture can be built up delineating the visible patch of sky. Its area is then found (e.g., by planimeter or by counting squares) and this value, expressed as a percentage of twice the

*D.S.I.R. Illumination Research, Technical Paper No. 7.
†J. Swarbrick, Easements of Light.

area of the whole diagram, is the daylight factor. The area of the diagram is multiplied by two because the diagram itself represents only half the sky, and the daylight factor is a percentage of the light from the whole sky.

The only point which, perhaps, is not obvious is the reason for the curvature of a horizontal line, such as the top of the window shown in Fig. 4. It will be appreciated, however, that the upper corner of a window, being farther away from the reference point, will appear at a smaller angle of elevation; and this being so, the top of the window is bound to be curved on the diagram. The authors of the method have, in fact, produced what are termed "droop lines,"* a family of curves representative of horizontal lines parallel to the plane of the window, as they would be found on the diagram, and using these one merely determines one convenient point in a horizontal line, and then traces it by following a droop line as far as necessary.

The diagram methods give a daylight factor at any one reference point,

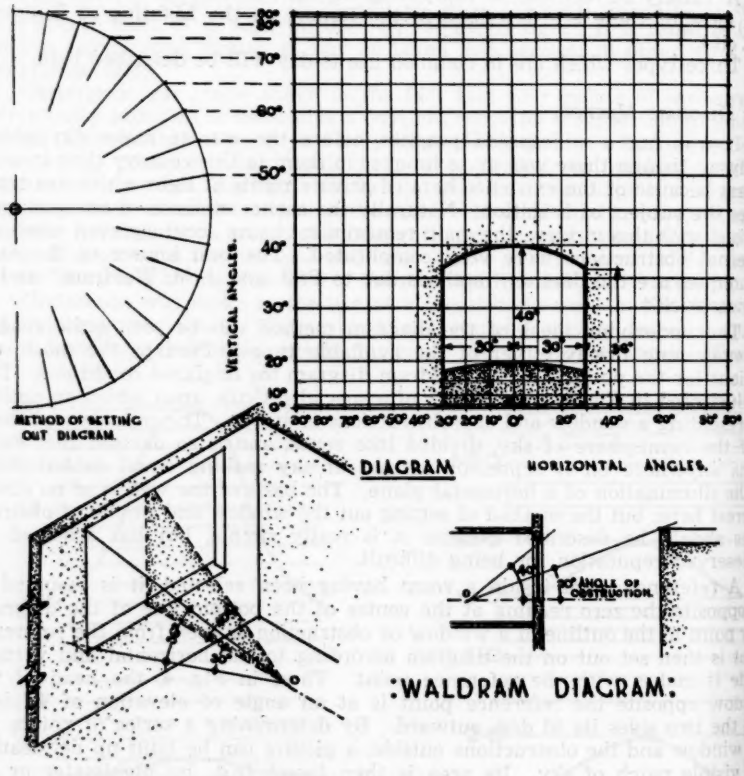

Fig. 4. The Waldram diagram for unglazed openings; showing how it is set out, and how any point upon it is determined.

* Illum. Research T.P. No. 7 (op cit.)

and it will be apparent that there is no particular difficulty about this part of the work. Sometimes it is said to be tedious, but even this is not entirely fair. No doubt where the obstruction is complicated and the daylighting has to be determined very accurately the methods require corresponding care, but if one is using them to study the daylighting of rooms at the design stage, the prudent course is to assume an external obstruction of the maximum height allowed by the bylaws, which will make the outline much simpler in most cases. If no such bylaws operate in a given case, the designer would be wise to take account of whatever possibility there is that obstructing buildings may be built in future.

The web shown in Fig. 4 is not corrected to allow for the loss of light on passing through glass. Diagrams corrected for vertical glazing have been published, however.† For many purposes it is sufficient to deduct 10 per cent. from readings with the uncorrected diagram, though one must exercise care in doing so with sloping glass. Here one is often interested in the light which comes at more or less grazing incidence through the glass, and then the loss may be much more than 10 per cent. In schools, for instance, where roof glazing is now recommended, one might be quite misled about the amount of light in various places, and it seems a fair question whether a method uncorrected for glazing should be used in such circumstances.

The Daylight Factor Protractors

The daylight factor protractors were designed and developed at the Building Research Station in the early part of the recent war to assist the economical use of glass in factories, economy being dependent on the efficient distribution of light.

The nature of the instruments will be seen from Fig. 5. A celluloid scale of protractor form is set out with divisions, each of which represents 1 per cent. daylight factor, and readings are made on a section drawing by placing the centre of the scale at the reference point and noting the number of divisions between lines drawn from that point to the upper and lower limits of the obstructions. In the figure these limits are the top and bottom of a window, but they might equally have been internal or external obstruction. The reading is 5.0 per cent. d.f.

The window in this case is assumed to be infinitely long, and it remains to apply a correction for the actual length. For this an auxiliary scale is available, consisting of concentric rings representing the average altitude of the visible patch of sky, crossed by curved lines of equal increment at 5 per cent. intervals reading to either side of a centre line. A reading is made as follows. The average angle of the visible patch of sky (not necessarily that of the window) is noted from the section drawing (18 deg. in this case). The scale is then placed with its centre at the reference point, from which lines have been drawn to the edges of the obstruction, and the reading is made along a concentric ring representing an altitude of 18 deg. (which might be rounded off to 15 deg.), between the points of intersection with the radiatjng lines. The amount of the correction is determined by totalling between the lines of equal increment, in this case 0.5 (or 5 per cent.) to one side of the reference point, and 0.15 to the other, making a total of 20 per cent. The daylight factor at the reference point is then 20 per cent. of 5.0, namely, 1.0 per cent.

Where the obstruction is non-uniform in height it may either be averaged,

† R.I.B.A.J., Oct. 17th, 1936, p. 1,072.

or divided up into suitable sections and the daylight factors calculated separately.

It will be noted that in the Figure the protractor shown is for vertical glazing. Others are available for horizontal glazing, for glass at slopes of

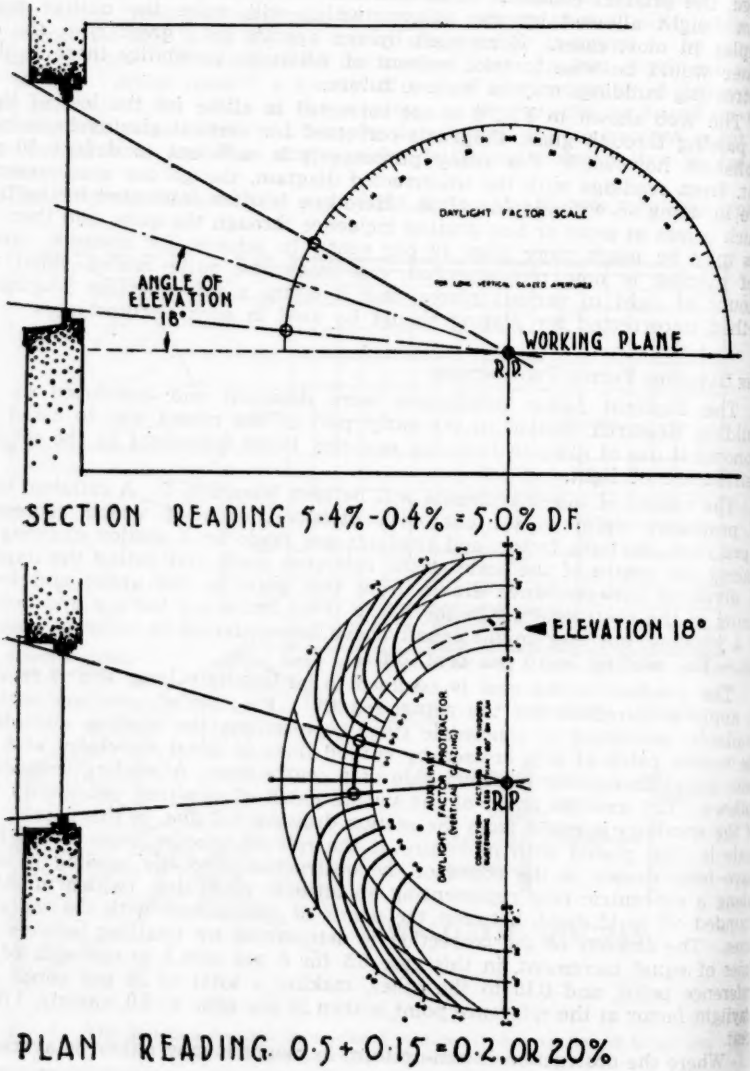

Fig. 5. Method of using B.R.S. daylight factor protractors.

30 deg. and 60 deg., and for unglazed openings, each with its own auxiliary scale.

Several hundred sets of protractors have now been issued and the method appears to be gaining a firm foothold in professional work.*

The Graded Daylight Factor Tables

Although neither of the two methods previously described offers any real difficulty in use, they are neither of them sufficiently direct to find usage on the widest scale, for instance for such a purpose as housing.

An attempt has been made to meet this need by the development of graded daylight factor tables in which the performance of windows of varying sizes has been tabulated ready for use. These tables were devised by the National Physical Laboratory, and are published by H.M. Stationery Office.† A sample sheet is shown as Fig. 6.

The tables were devised in connection with the work of the Post-War Study Committee on the lighting of buildings (*op. cit.*) and the tabulation is in the same terms as the Committee's proposed standards of daylighting, namely, the penetration of a given daylight factor and the area within the contour at that value. Additionally, the half-breadth of contour is given, to help in setting out the contour on plan if one should wish to do so; and values are tabulated for three daylight factors and for five angles of obstruction.

The use of the tables is essentially as follows. Assuming that the daylight penetration and area requirements are known for a given room, and the angle of elevation of the obstruction, the appropriate table is consulted and the sizes of various acceptable windows, of different heights and widths can be read off directly. The tables are issued with instructions for use, but an abbreviated statement is given below based on the draft Code of Practice for Daylighting.‡

There are fifteen tables in three groups of five—one group for each of the 2 per cent., 1 per cent., and 0.5 per cent. daylight factors.

The five tables in each group are for varying degrees of obstruction, rising from 0 deg. to 60 deg. in increments of 15 deg., the angle being measured from the sill height.

Each table shows the depth to which the relevant daylight factor penetrates, the distance it spreads to either side of the centre-line through the window, and the area it encloses. Penetration is measured from the outer face of the external wall.

It is assumed that window sill and working plane are 2 ft. 9 in. above floor level; but it is not important that the sill should actually be at this level. It may be up six or more inches before any significant loss of light occurs. Glass below 2 ft. 9 in. is not assumed to contribute light for the purpose of the standard.

The tables are calculated for windows without glazing bars, i.e., the whole width and height given is assumed to be glazed. Allowance for obstruction by window bars and mullions may be made by a *pro rata* increase in the width of the window to compensate the area thus obstructed, the frame normally being excluded from this allowance, because from in-

* Up to now the protractors have been sold at the Building Research Station at a price of 1s. each, post free. Since this paper was written a booklet of instructions has been published by H.M. Stationery Office (Building Research Technical Paper No. 28, "Protractors for the Computation of Daylight Factors," by A. F. Dufton). The protractors are also available at H.M. Stationery Office (price 10s. per set or 2s. 6d. per pair).

† The Natural Lighting of Houses and Flats, with Graded Daylight Factor Tables, by T. Smith and E. Brown.

‡ British Standard (Draft) Code of Practice, Chapter 1 (A).

Graded Daylight-Factor Tables for Unbarred Windows
1 Per Cent. Daylight Factor: 15° Obstruction

Height of Window Head above Working Plane	Width of Window 3′ 0″	3′ 6″	4′ 0″	4′ 6″	5′ 0″	5′ 6″	6′ 0″	6′ 6″	7′ 0″	7′ 6″	8′ 0
					Depth of Penetration in Feet						
6′ 0″	9·0	9·5	9·9	10·3	10·7	11·0	11·3	11·5	11·8	12·0	12·2
5′ 9″	8·8	9·3	9·7	10·0	10·4	10·7	10·9	11·2	11·4	11·6	11·8
5′ 6″	8·5	9·0	9·4	9·7	10·1	10·3	10·6	10·8	11·0	11·3	11·5
5′ 3″	8·3	8·7	9·1	9·4	9·7	10·0	10·2	10·5	10·7	10·9	11·1
5′ 0″	8·0	8·4	8·8	9·1	9·4	9·6	9·9	10·1	10·3	10·5	10·7
4′ 9″	7·7	8·1	8·5	8·8	9·1	9·3	9·5	9·7	9·9	10·1	10·3
4′ 6″	7·5	7·8	8·2	8·5	8·7	8·9	9·2	9·3	9·5	9·7	9·8
4′ 3″	7·2	7·5	7·8	8·1	8·4	8·6	8·8	9·0	9·1	9·3	9·4
4′ 0″	6·9	7·2	7·5	7·8	8·0	8·2	8·4	8·6	8·7	8·8	9·0
3′ 9″	6·6	6·9	7·2	7·4	7·6	7·8	8·0	8·1	8·3	8·4	8·5
3′ 6″	6·3	6·6	6·8	7·0	7·2	7·4	7·6	7·7	7·8	8·0	8·1
3′ 3″	6·0	6·2	6·5	6·7	6·9	7·0	7·2	7·3	7·4	7·5	7·6
3′ 0″	5·6	5·9	6·1	6·3	6·5	6·6	6·7	6·8	6·9	7·0	7·1
2′ 9″	5·3	5·5	5·7	5·9	6·0	6·2	6·3	6·4	6·5	6·6	6·6
2′ 6″	5·0	5·2	5·3	5·5	5·6	5·7	5·8	5·9	6·0	6·1	6·1
					Half-Breadth of Daylight Area in Feet						
6′ 0″	6·5	6·9	7·3	7·8	8·2	8·5	8·9	9·2	9·6	9·9	10·2
5′ 9″	6·3	6·8	7·2	7·6	8·0	8·3	8·7	9·0	9·4	9·7	10·0
5′ 6″	6·2	6·6	7·0	7·4	7·8	8·1	8·5	8·8	9·2	9·5	9·8
5′ 3″	6·0	6·4	6·8	7·2	7·6	7·9	8·3	8·6	8·9	9·3	9·6
5′ 0″	5·8	6·3	6·7	7·0	7·4	7·7	8·1	8·4	8·7	9·0	9·4
4′ 9″	5·7	6·1	6·5	6·9	7·2	7·5	7·9	8·2	8·5	8·8	9·1
4′ 6″	5·5	5·9	6·3	6·7	7·0	7·3	7·7	8·0	8·3	8·6	8·9
4′ 3″	5·4	5·7	6·1	6·5	6·8	7·1	7·5	7·8	8·1	8·4	8·7
4′ 0″	5·2	5·6	5·9	6·3	6·6	6·9	7·2	7·6	7·9	8·2	8·5
3′ 9″	5·0	5·4	5·7	6·1	6·4	6·7	7·0	7·3	7·7	8·0	8·3
3′ 6″	4·8	5·2	5·5	5·9	6·2	6·5	6·8	7·1	7·4	7·8	8·1
3′ 3″	4·6	5·0	5·3	5·6	6·0	6·3	6·6	6·9	7·2	7·6	7·9
3′ 0″	4·4	4·8	5·1	5·4	5·7	6·1	6·4	6·7	7·0	7·4	7·7
2′ 9″	4·2	4·6	4·9	5·2	5·5	5·9	6·2	6·5	6·8	7·2	7·5
2′ 6″	4·0	4·4	4·7	5·0	5·3	5·6	6·0	6·3	6·6	7·0	7·4
					Daylight Area in Square Feet						
6′ 0″	92	104	115	126	137	147	157	167	177	187	196
5′ 9″	87	98	109	120	130	140	149	159	168	177	186
5′ 6″	82	93	103	113	123	132	141	150	159	168	176
5′ 3″	78	88	98	107	116	125	133	142	150	158	166
5′ 0″	73	83	92	101	109	118	126	133	141	149	157
4′ 9″	69	78	86	95	103	110	118	125	133	140	147
4′ 6″	65	73	81	89	96	103	110	117	124	131	138
4′ 3″	60	68	75	82	89	96	103	109	116	122	129
4′ 0″	56	63	70	76	83	89	95	102	108	114	120
3′ 9″	52	58	65	71	77	82	88	94	100	105	111
3′ 6″	48	53	59	65	70	76	81	86	92	97	103
3′ 3″	43	49	54	59	64	69	74	79	84	89	94
3′ 0″	39	44	49	54	58	63	67	72	77	81	86
2′ 9″	35	40	44	48	52	57	61	65	69	74	78
2′ 6″	31	35	39	43	47	51	54	58	62	66	70

Fig. 6. A typical page from the publication "Graded Daylight Factor Tables."

side the room the limiting obstruction is usually not the frame but rather the reveals of the window unless the frame is exceptionally deep or fixed at the outer face of the wall so that in effect there is no outer reveal.

In the tables an allowance of 20 per cent. has been made for light lost in passing through the glass, and for a certain amount of loss through dirt. If the windows are left until they are obviously dirty the loss will exceed this value, but it is considered a fair average.

A number of problems arise in extending the use of the tables by simple means to the full variety of practical cases, such as multiple windows, windows in two or more walls, bay windows, and windows under balconies. Mr. Waldram has recently published a note examining the extension of the use of the tables to certain of these cases,* and the Building Research Station has made other studies of this sort in connection with the Code of Practice.

As is so often the case the production of methods sufficiently simple to command the widest acceptance, without unreasonable inaccuracies, offers many difficulties; but these are being cleared up in revising the Draft Code.

Perhaps a comment may be offered here on one point about the tables which has received some public attention. It is recommended that angles of elevation of obstruction be measured from the window sill (assumed to be at working plane level), and it was suggested that this involved some risk of inaccuracy if obstructions were close to the windows. Obviously the best place from which to measure angles of obstruction is the reference point inside the room; but this has practical difficulties, and the alternative was put forward of making the measurements from the window head. This, however, appears to have two disadvantages, one that the level of the window head may not be known until the window is selected; and the other that it would not deal so effectively with nearby obstructions as would a measurement from the sill. For instance, it would allow a wall to be built just outside the window to its full height, cutting off all the light, before any angle of obstruction would be registered. Thus it was decided to continue to recommend that such measurements be made from the sill. If the obstruction is near the window, e.g. 20 ft. away, it would, perhaps, be worth while to check the daylighting by one of the other methods if it is desired to use a window of minimum size.

One other point remains to be noted. At present they are set out for angles of obstruction at intervals of 15 deg. This means that interpolation is necessary. The process is not difficult, for it can be made with acceptable accuracy by simple division between readings; but it is an added step in the work, and it may be desirable ultimately to introduce tables at 5 deg. stages, especially in the important region between 15 deg. and 30 deg., at which most blocks of flats occur. For houses no complication of this kind normally enters, for one can make the assumption for normal suburban practice that the angle of obstruction at the front and rear of a house will be nearly enough 15 deg.

A Comparative Summary of the Three Methods in Practice

Unfortunately, none of the three methods mentioned here is suitable for all of the day-to-day routine work of building practice, and one has to consider, therefore, which types are best for which purposes.

For checking the windows of houses no question arises; the tables are

* The Relative Efficiency of Single and Multiple Windows, by P. J. Waldram, R.I.B.A.J., Nov., 1945, p. 14.

easily obtained and inexpensive, and undoubtedly form the simplest method. They were devised and intended only for domestic lighting.

Flats, unfortunately, are not quite so easily disposed of. There will be many cases where the obstructing sky line is more or less uniform, and when that is so the tables can be used without much trouble,† though interpolation may be necessary in the readings. If the sky line is decidedly irregular, which may be the case, then one of the other two methods would have to be used and between these there may be little to choose though a complicated sky line seems likely to make the diagram method slightly preferable because both the labour and the risk of error increase in such cases with the protractor method. As mentioned earlier, therefore, it is very desirable that the diagram methods, especially those corrected for glazing, should be made readily available commercially. The protractors, however, can certainly deal with such cases and their present availability gives them an effective advantage.

One point about the standards of domestic daylighting should be mentioned here. They are in two terms as they stand; first, with a requirement for penetration, and secondly, for daylight area. Penetration can be checked by two or three readings at most, but the determination of a contour for the measurement of daylight area may require a dozen or more. It is, therefore, worth while to say here that if the penetration requirement is satisfied the daylight area will normally also be adequate with one outstanding exception, namely, a case where the view from a window is obstructed sharply on one or both sides as, for instance, by a projecting wing of the building.

For the general case of office lighting, and in other places where vertical glazing is used, there seems little to choose between the protractors and the diagram methods though, perhaps, on the whole, the latter will generally be easier.

Finally, where sloping glazing is used, as in schools and factories, the protractors would appear the obvious method, if not the only satisfactory one, because they provide the proper correction for the slope of the glass. The fact that in such cases external obstructions rarely come into the analysis also favours the use of protractors.

Art galleries and other places where illumination of high refinement is required should probably be treated as special cases.

Daylighting Design Practice and the Quality of Light.

The relative convenience of measuring the amount of daylight on the working plane commonly leads to a too-exclusive interest in this side of the matter; and from it there follows a very real danger that despite apparently adequate illumination on the working plane the lighting of the room will be neither good nor pleasant. The fact that this is so has even led some architects to deprecate the analysis of daylighting. The question of what is good lighting must therefore be explored in other ways.

The primary criterion, of course, is not whether there is enough light, but whether our eyes can take good advantage of it. Their ability in this respect is not fixed, but alters according to the condition of lighting in the environment as a whole; and it is quite possible that in one environment a working intensity of 10 foot-candles would be more use to us than 20 foot-candles in another which is not so good in other respects. Essentially it comes down to this, that the retina of the eye cannot accommodate strong contrasts in the field

† It has been suggested that where differences in the angle of obstruction do not cover more than 20 degrees, the angle can be averaged without risk of serious error.

of view and where these occur vision will be more or less unsatisfactory, no matter what intensity is provided in the working plane.

A striking demonstration of this was observed lately when a few people interested in lighting visited some London buildings, originally for the purpose of studying mixtures of natural and artificial light. It took place on one of the clearest and brightest days of midsummer, when one would expect as good daylighting as one ever gets; but the interesting feature of the visit was the discovery that artificial light was often being used in many cases where it added little or nothing to the usefulness of illumination on the working plane. Most striking was the case of a large building overlooking the Thames, where the effect of external obstructions was nil; yet in virtually every occupied room here the artificial light was turned on. It could not be said that it was needed to light the working plane, for the windows were quite large and the artificial lights very weak (40 and 60 watt incandescent lamps). Moreover, there were seldom more than two people in a room, and their desks were usually placed near the windows. The enigma could only be explained by the suggestion that the artificial light relieved a sense of glare which was otherwise present, for the brightness of the unobstructed view through the windows was in strong contrast to the surrounding wall surfaces, and the contrast was certainly sufficient to be unpleasant. The effect of the artificial light was to illumine the offending walls, with a consequent reduction in contrasts between them and the sky.

Later the same day other buildings were seen which were quite sharply obstructed by neighbouring walls, and in these cases the artificial light appeared to be much less in demand. This is in accord with the view just mentioned, for the condition where the bright sky is replaced by a less bright wall is bound to offer less contrast than the other and accordingly be more satisfying; though obviously this idea can be carried too far.

The observation has much interest in so far as it cuts across the common supposition that the best daylighting is provided by the least obstructed conditions. At the same time this is not to be interpreted as an argument for the value of high obstructions, but rather for conditions of lower contrasts which are obtainable in a variety of ways.

One way of reducing contrasts is, of course, to illumine the wall areas generally and particularly those around windows. That was the object in turning on the lights in the building mentioned above; but it can be done very much better by fluorescent lights and perhaps better still by the use of other windows suitably placed to give cross lighting.

Other methods of exploiting this principle will be apparent, for instance, by the development of reflection in rooms—but they need not detain us here, with one exception; for it should be noted that merely by increasing the amount of light entering the room we can reduce the general contrast between indoor and outdoor illumination and diminish thereby the risk of window glare in a design. This is important because it means that if we set and reach adequate quantitative standards of lighting we should in many cases at least automatically ensure that the illumination in a room does not suffer from the worst conditions of contrast. In other words, there is an elementary link of sorts between the quantity of light and the quality of lighting which justifies much of the emphasis thrown upon the measurement side of daylighting, quite apart from

the simple need to provide a reasonable amount of light for the normal use of rooms.

The Position in Summary.

If what has been said about the importance of avoiding strong contrasts in rooms appears to diminish the importance of making quantitative analyses of lighting, let us recall their particular value.

In the first place, they form the foundation of day-to-day practice. No other means simple enough to command popular acceptance has yet been devised which we can associate with a set of standards and which can so effectively avoid bad lighting as does the assessment of daylight factors on the working plane. Perhaps if bad daylighting was a less common occurrence the force of this argument would be reduced; but daylight is a somewhat intangible commodity, and in the very circumstances where it is most likely to suffer—namely, where high land values tend to produce congested building developments—its intangibility often causes it to be neglected. One of the great merits of measurement, then, is to give some "substance" to daylighting by which it can gain a permanent foothold as an effective function of building design.

Measurement also is a simpler idea to grasp and put into operation than some of the subtler points of good lighting mentioned towards the end of this note, and although they will be of much value in the refinement of building design when more widely known, they cannot claim to have the broad, elementary usefulness of the simple calculations which have been described.

A third, and in some cases conclusive, point in support of the wide use of analytical methods occurs where uniform distribution of light is important. In schools, for instance, and in factories occupants are not free to move from inadequate light to a place where it is better, and therefore a degree of uniformity is necessary. A reasonable accuracy in this respect is impossible without analysis.

At the same time, experience shows that those who make measurements of daylighting usually find them a convenient stepping stone to refinements, and it is certainly desirable that they should as soon as possible acquire a sensitivity to these. The main point is the question of contrasts, which has been mentioned here, but there are others which have not been mentioned and of which there are, indeed, no adequate descriptions yet available. This is a matter which is receiving attention.

Finally, reference should be made to relative professional responsibilities, for this note is addressed to both architects and illuminating engineers. It probably goes without saying that the latter should be familiar with the matters mentioned here, on the general ground that as illuminating engineers their field includes natural lighting as well as the more familiar work of artificial lighting. But this could not detract from the importance of architects acquiring competence with daylighting design, for this has to do with the size of windows, their location, and—in the ultimate stages—of refinement of many details around and about windows, with all of which building design and construction is intimately bound up. It does not seem feasible that any practice of consultation as between one profession and another could adequately meet this day-to-day requirement of architectural practice, though without doubt there will be a natural growth of consultation on many points as the developing interests of the two professions become more clearly defined in this field.

PROVISIONAL SYLLABUS OF MEETINGS
(SESSION 1946—1947)

SESSIONAL MEETINGS IN LONDON

Unless otherwise announced, meetings will be held at **6 p.m.**

1946.

Tuesday, Oct. 8th. Address by the President (Mr. J. S. Dow). (*To be held at the School of Hygiene and Tropical Medicine, Keppel Street* (*Gower Street*), *London, W.C.*1.) **5.30 p.m.** for **6 p.m.**

Wednesday, Nov. 6th. New Light in Old Buildings, by Mr. E. H. Penwarden and Mr. S. Anderson. (*Joint meeting with the R.I.B.A. To be held at the R.I.B.A.*, 66, *Portland Place, London, W.*1.) **6 p.m.**

Tuesday, Dec. 10th. Railway Lighting. Some Lessons from Experience and Views on the Future, by Mr. A. Cunnington and Mr. G. W. Golds. (*To be held at the E.L.M.A. Lighting Service Bureau*, 2, *Savoy Hill, London, W.C.*2.) **6 p.m.**

1947.

Tuesday, Jan. 14th. Colour in Illuminating Engineering, by Dr. W. D. Wright. (*To be held at the E.L.M.A. Lighting Service Bureau*, 2, *Savoy Hill, London, W.C.*2.) **6 p.m.**

Tuesday, Feb. 11th. Photometry of Searchlights and Kindred Problems. (Several papers on various aspects will be presented.) (*To be held at the E.L.M.A. Lighting Service Bureau*, 2, *Savoy Hill, London, W.C.*2.) **6 p.m.**

Tuesday, Mar. 11th. A Review of Problems Connected with Mine Lighting, by Mr. J. Ivon Graham, Chairman of the Mine Lighting Sub-Committee of the National Illumination Committee of Great Britain. (*To be held at the E.L.M.A. Lighting Service Bureau*, 2, *Savoy Hill, London, W.C.*2.) **6 p.m.**

Tuesday, April 15th. Experiments on the Design and Illumination of Traffic Signs, by Mr. J. B. S. Smyth. (*To be held at the School of Hygiene and Tropical Medicine, Keppel Street*, (*Gower Street*), *London, W.C.*1.)

Tuesday, May 13th. Annual General Meeting followed by an address by Dr. N. A. Halbertsma, President of the International Commission on Illumination. (*To be held at the Institution of Mechanical Engineers, Storey's Gate, London, S.W.*1.) **6 p.m.**

BATH AND BRISTOL CENTRE [WESTERN AREA]

(*Hon. Secretary:* R. S. Hazell, c/o The General Electric Co., Ltd., Lawford Street, Old Market, Bristol, 2.)

Meetings will be held alternately at Radiant House, Bristol, and Electricity Showrooms, Bath, at **7 p.m.**

1946.

Sept. 6th. Basic Principles of Lighting, by Mr. E. B. Sawyer. (*At Radiant House, Bristol.*)

Oct. 11th. Fluorescent Lighting Practice, by Mr. W. J. Jones. (*At Electricity Showrooms, Bath.*)

Nov. 1st. Civic Luncheon and Exhibition, 1 p.m.—6 p.m. Address by the President (Mr. J. S. Dow), **7.30 p.m.** (*At Grand Hotel, Bristol.*)

Dec. 6th. The Lighting of Public Buildings, by Mr. W. T. F. Souter. (*At Electricity Showrooms, Bath.*)

1947.

Jan. 3rd. Store and Display Lighting, by Mr. D. C. James. (*At Radiant House, Bristol.*)

Feb. 7th. Problems of Industrial Lighting and Colour, by Mr. T. S. Jones. (*At Electricity Showrooms, Bath.*)

Mar. 7th. The Economics of Good Lighting—Debate. (*At The Grand Hotel, Bristol.*)

April 11th. The Use of Commercial Glass in the Lighting Industry, by Mr. R. E. Bastick. (*At Electricity Showrooms, Bath.*)

May 2nd. Annual General Meeting. Drawing Office Lighting, by Mr. L. C. Rettig (Chairman).

PROVISIONAL SYLLABUS OF MEETINGS (SESSION 1946—1947)

BIRMINGHAM CENTRE [MIDLAND AREA]

(*Hon. Secretary:* W. J. P. WATSON, 91, Brandwood Road, Kings Heath, Birmingham 14.)
Meetings will be held at the Imperial Hotel, Temple Street, Birmingham, at **6 p.m.** *Tea Buffet,* **5.30 p.m.**

1946.

Oct. 11th. Address by the Chairman (MR. R. MACKENZIE).
Nov. 22nd. Lighting for Photography, by MR. G. A. JONES.
Dec. 6th. Debate:—"Can the I.E.S. Code be profitably applied to Industry."

1947.

Jan. 3rd. Industrial Decoration, by DR. J. H. NELSON.
Feb. 7th. Some Recent Trends in Daylighting, by MR. W. A. ALLEN.
Feb. 28th. Annual General Meeting and Address by the President (MR. J. S. DOW).
April 18th. Portable Photometers, by MR. J. S. PRESTON.
May 9th. The Physical Nature of Light, by MR. H. J. CULL.

CARDIFF CENTRE [SOUTH WALES AREA]

(*Hon. Secretary:* S. G. TURNER, Mervyn House, Frederick Street, Cardiff.)

1946.

Oct. 10th. Lighting Through the Ages, by MR. W. J. JONES. (*To be held at the Guildhall, Swansea, when the Mayor will preside at a Civic Reception.*) **3 p.m.**
Nov. 6th. Day-Night Flying, by MR. A. W. GOSTT. (*To be held at Cardiff Corporation Demonstration Theatre.*) **6.30 p.m.**
Dec. 5th. Improvements in Mine Lighting, by MR. C. S. CHUBB. Joint Meeting S.W.I.E. and A.M.I.E.E. (*To be held at the South Wales Institute of Engineers, Cardiff.*) **6 p.m.**
Dec. 13th. Dinner Dance. (*To be held at the Park Hotel, Cardiff.*) **7 p.m.** till **1 a.m.**

1947.

Jan. 8th. Domestic Lighting Problems. Question-Master—PROFESSOR T. DAVID JONES. (*To be held in the Cardiff Corporation Demonstration Theatre.*) **3.15 p.m.**
Jan. 20th, 21st and 22nd. Lectures to Rhondda Schools—(Details to be announced.)
Feb. 6th. Address by the President (MR. J. S. DOW). (*To be held at the Cardiff Corporation Demonstration Theatre.*) **3 p.m.**
Mar. 6th. Colour and the Eye, by DR. J. H. SHAXBY. (*To be held at the Town Hall, Newport*). **3 p.m.**
April 9th. The Future Trend of School Lighting. Speaker to be announced. (*To be held at the Cardiff Corporation Demonstration Theatre.*) **5.30 p.m.**
May 1st. Annual Luncheon. (*To be held at the Park Hotel, Cardiff.*)
May 8th. Annual General Meeting. Modern Church Lighting, by MR. P. J. WATSON. (*To be held at Swansea.*)

EDINBURGH CENTRE [SCOTTISH AREA]

(*Hon. Secretary:* S. G. BATT, 8, George Street, Edinburgh 2.)
Meetings will be held at Heriot-Watt College, Chambers Street, Edinburgh 1, at **6.30 p.m.**

1946.

Oct. 4th. Address by the Chairman (PROF. M. G. SAY) on **Stage Illusions.**
Nov. 8th. Light and Interior Decoration, by MR. T. O. FREETH.
Dec. 6th. Joint Meeting with the Royal Scottish Society of Arts. (Details to be announced.)

1947.

Jan. 10th. New Light in Old Buildings, by MR. E. H. PENWARDEN and MR. S. ANDERSON. (*Joint meeting with the Edinburgh Architectural Association.*)
Feb. 7th. Recent Developments in Transport Lighting, by MR. T. CATTEN and MR. DE RITTER.
Mar. 7th. Annual General Meeting. (Details of paper or discussion to be announced.)

PROVISIONAL SYLLABUS OF MEETINGS (SESSION 1946—1947)

GLASGOW CENTRE [SCOTTISH AREA]

(*Hon. Secretary:* A. M. RANKIN, 29, St. Vincent Place, Glasgow, C.1.)

Meetings will be held at the Institution of Engineers and Shipbuilders in Scotland, 39, Elmbank Crescent, Glasgow C.3, at **6 p.m.**

1946.

Oct. 3rd. Stage Illusions, by PROFESSOR M. G. SAY.

Nov. 7th. Light and Interior Decoration, by MR. T. O. FREETH.

Dec. 5th. The Operation of Street and Traffic Control Lighting, by MR. F. M. HALE.

1947.

Jan. 9th. New Light in Old Buildings, by MR. E. H. PENWARDEN and MR. S. ANDERSON.

Feb. 6th. Modern Passenger Transport Lighting, by MR. T. CATTEN and MR. DE RITTER.

Mar. 20th. Annual General Meeting. Address by the President (MR. J. S. DOW). Social Evening.

LEEDS CENTRE [NORTH MIDLAND AREA]

(*Hon. Secretary:* ERIC SMITH, 28, St. Paul's Street, Leeds).

Meetings will be held at the Electricity Showrooms, The Headrow, Leeds, at **6 p.m.**

1946.

Oct. 7th. Dinner followed by the Chairman's Address (MR. H. W. HARRIS).

Nov. 4th. Impressions of a Lighting Engineer in Industry, by MR. S. D. LAY.

Dec. 2nd. To be announced.

1947.

Jan. 6th. The Physics of Electric Discharge Lighting, by MR. H. W. HIME.

Feb. 3rd. Practical Aspects of Interior Lighting Installations, by MR. E. A. FOWLER.

Mar. 3rd. Plastics in the Lighting Industry. (Speaker to be announced.)

Mar. 31st. Glass in the Service of Light, by DR. A. J. HOLLAND.

April 22nd. Annual General Meeting followed by Address by the President (MR. J. S. DOW).

LEICESTER CENTRE [MIDLAND AREA]

(*Hon. Secretary:* W. N. COULSON, 5, Campbell Street, Leicester.)

Meetings will be held at the Corporation of Leicester Electricity Department, Demonstration Theatre, Charles Street, Leicester, at **6.30 p.m.**

1946.

Sept. 3rd. Luncheon at The Leicester Co-operative Society's Cafe, High Street.

Sept. 11th. Visit to Dunlop Rubber Co., Ltd., Works, Fort Dunlop.

Oct. 15th. Interior Lighting, by MR. R. O. ACKERLEY.

Nov. 12th. Lighting in Mines. (Speaker to be announced.)

Dec. 10th. Domestic Lighting, by MR. T. O. FREETH. (Joint Meeting with the Electrical Association for Women.)

1947.

Jan. 14th. School Lighting, by MR. T. S. JONES.

Feb. 11th. Street Lighting, by MR. T. WILKIE. (Joint Meeting with the A.P.L.E.)

Feb. 20th. Visit to Leicester Generating Station.

Mar. 11th. Visit to Chance Bros. Glassworks, Smethwick.

April 15th. Planning for Recreation with special reference to Lighting, by MR. E. W. MAWSON.

May 17th. Annual General Meeting and Luncheon.

June 21st. Summer Outing. (Details to be announced.)

PROVISIONAL SYLLABUS OF MEETINGS (SESSION 1946—1947)

LIVERPOOL CENTRE [NORTH WESTERN AREA]

(*Hon. Secretary:* K. R. MACKLEY, 24, Dale Street, Liverpool, 2.)

Meetings will be held in the Liverpool Corporation Electricity Showrooms, Whitechapel, Liverpool, at **6 p.m.**

1946.

Oct. 1st. Lamp Development—Peacetime Application of Wartime Introductions, by MR. H. R. RUFF.

Nov. 11th. Lighting and Interior Decoration, by MR. T. O. FREETH. (*Joint meeting with the Electrical Association for Women.*)

Dec. 10th. Colour in Industry, by DR. J. H. NELSON.

1947.

Jan. 14th. Members' Night. (Details to be announced.)

Feb. 11th. Coloured and Directional Lighting, by MR. L. G. APPLEBEE. (*Joint meeting with the Liverpool City School of Art.*)

Mar. 11th. Maintenance and Efficient Operation of Fluorescent Lighting, by MR. A. L. RANDALL.

April 8th. Street Lighting, by MR. J. M. WALDRAM.

MANCHESTER CENTRE [NORTH WESTERN AREA]

(*Hon. Secretary:* W. BALLARD, Magnet House, Victoria Bridge, Manchester, 3.)

Meetings will be held in the Reynolds Hall, College of Technology, Sackville Street, Manchester, at **6 p.m.**

1946.

Oct. 3rd. Problems Night. (Details to be announced.)

Nov. 14th. The place of Science in the Art of Lighting, by MR. R. O. ACKERLEY and MR. ALISTER MACDONALD. (*Joint meeting with the Manchester Society of Architects.*)

Dec. 12th. Colour and the Eye, by DR. J. H. SHAXBY. (*Joint meeting with the Institute of Physics (Manchester and District Branch).*)

1947.

Jan. 16th. The Measurement of Light, by DR. J. W. T. WALSH.

Feb. 13th. Recent Advances in Luminescent Materials for Electronic Devices, by MR. H. MEYER and MR. G. A. R. TOMES. (*Joint meeting with the Institution of Electronics (N.W. England Section) at* **6.30 p.m.**)

Mar. 13th. Lighting the Home, by MR. T. O. FREETH. (*Joint meeting with the Electrical Association for Women.*)

April 10th. Lighting in Coal Mines, by DR. W. J. WELLWOOD FERGUSON.

NEWCASTLE CENTRE [NORTH EASTERN AREA]

(*Hon. Secretary:* A. J. OGLE, Carliol House, Newcastle-on-Tyne.)

Meetings will be held in the Minor Durant Hall, Oxford Street, Newcastle-upon-Tyne, at **6.15 p.m.**

1946.

Oct. 9th. Address by the Chairman (MR. R. W. GREGORY) **on Windows versus Watts.**

Nov. 6th. The High Brightness Mercury Vapour Discharge Lamp, by MR. H. W. CUMMING.

Dec. 4th. The History and Development of Lighting, by MR. H. L. JAMES.

1947.

Jan. 8th. Address by the President (MR. J. S. DOW) **and a Social Function.**

Feb. 5th. High Voltage Light Sources, by MR. H. G. JENKINS and MR. J. N. BOWTELL.

Mar. 5th. New Light in Old Buildings, by MR. E. H. PENWARDEN and MR. S. ANDERSON.

April 2nd. Aluminium Reflectors with Particular Reference to Mine Lighting, by MR. T. THOMPSON. **Annual General Meeting.**

PROVISIONAL SYLLABUS OF MEETINGS (SESSION 1946—1947)

NOTTINGHAM CENTRE

(*Hon. Secretary:* C. S. CAUNT, 62, Thackerays Lane, Woodthorpe, Nottingham.)
Meetings will be held in the City of Nottingham Gas Department Demonstration Theatre, Parliament Street, Nottingham, at **5.30 p.m.**

1946.

Sept. 13th. Annual General Meeting, Luncheon and Chairman's Address, by MR. R. G. PAYNE.

Oct. 4th. High Voltage Fluorescent Light Sources, by MR. H. G. JENKINS and MR. J. N. BOWTELL.

Nov. 1. Power Factor and The Lighting Engineer, by DR. E. C. WALTON.

Dec. 6th. The Lighting of Public Highways, by MR. W. D. SINCLAIR.

1947.

Jan. 3rd. Four 15-minute papers on Lighting as Applied to:—

1. **Churches,** by MR. C. S. CAUNT.
2. **Drawing Offices,** by MR. A. S. HACKMAN.
3. **Hospitals,** by MR. E. G. PHILLIPS.
4. **Schools,** by MR. N. C. SLATER.

Feb. 7th. Glassware Manufacture with Particular Reference to the Lighting Industry, by DR. W. M. HAMPTON.

Mar. 7th. Engineering Applications of Polarised Light, by MR. J. WARD.

April 4th. Annual Dinner and Visit of the President (MR. J. S. DOW).

SHEFFIELD CENTRE [NORTH MIDLAND AREA]

(*Hon. Secretary:* D. H. FOX, Howard Gallery, Chapel Walk, Sheffield.)
Meetings will be held at the Sheffield University, Western Bank, Sheffield, 10, *at* **6 p.m.**

1946.

Oct. 8th. Address by the Chairman (DR. A. J. HOLLAND).

Nov. 5th. Social Evening with Fireworks.

Nov. 11th. Visit to the East Hecla Works of Messrs. Hadfield's, Ltd., Sheffield.

Dec. 2nd. "Nomograms," by MR. W. J. G. DAVEY.

1947.

Feb. 3rd. Planned Maintenance of Industrial Lighting Installation, by MR. C. F. HURD.

Mar. 4th. Plastics in the Lighting Industry. (Speaker to be announced.)

April 21st. Annual General Meeting followed by Address by the President (MR. J. S. DOW).

BRADFORD GROUP [NORTH MIDLAND AREA]

(*Joint Hon. Secretaries:* A. J. HUTCHINSON, 47–50 Sunbridge Road, Bradford. W. H. NAYLOR, 40, Godwin Street, Bradford.)
Meetings will be held in Bradford Corporation Electricity Offices, Sunbridge Road, Bradford, at **7.30 p.m.**

1946.

Sept. 26th. Industrial Lighting. A General Survey, by MR. T. S. JONES.

Oct. 24th. Lighting for Flying, by MR. A. W. GOSTT.

Nov. 21st. Industrial Lighting; Design of Fittings and Planning of Installations, by MR. A. G. SMITH.

Dec 19th. (To be announced.)

1947.

Jan. 16th. Industrial Lighting: Erection and Installation, by MR. NORMAN C. SLATER.

Feb. 13th. Recent Advances in Light Production, by DR. G. O. STEPHENS.

Mar. 13th. Industrial Lighting; Planned Maintenance, by MR. C. F. HURD.

April 10th. Lighting for Photography, by MR. R. B. MORRIS.

PROVISIONAL SYLLABUS OF MEETINGS (SESSION 1946—1947)

THE GLOUCESTER AND CHELTENHAM GROUP [WESTERN AREA]

(*Hon. Secretary:* G. V. GARDNER, 29, Wellington Street, Gloucester.)

Meetings will be held alternately at Gloucester and Cheltenham, at **7 p.m.**

1946.

Oct. 3rd. Visit to Castle Meads C.E.B. Station.

Nov. 7th. The Cavalcade of Gas, by MR. W. CHARD.

Dec. 3rd. Coloured and Directional Light as Applied to the Theatre, by MR. L. G. APPLEBEE. (*To be held at the Cheltenham Town Hall.*)

1947.

Jan. 2nd. Physics of Light. (Speaker to be announced.)

Feb. 6th. Lecture and Film. (Details to be announced.)

Mar. 6th. Film Programme including the I.E.S. Film, "Let Us See." (Details to be announced.)

April 3rd. Debate Fluorescent v. Incandescent Lamps for Industrial Lighting. (Details to be announced.)

May 2nd. Railway Lighting. (Details to be announced.)

HALIFAX GROUP [NORTH MIDLAND AREA]

(*Hon. Secretary:* H. W. LODGE, Public Lighting Dept., Mulcture Hall Road, Halifax.)

[To be announced.]

HUDDERSFIELD GROUP [NORTH MIDLAND AREA]

(*Hon. Secretary:* E. WOOD, 11, Long Grove Avenue, Dalton, Huddersfield.)

Meetings will be held in the Electricity Showrooms, Market Street, Huddersfield, at **7 p.m.**

1946.

Oct. 8th. Television, by MR. J. T. THORNTON.

Nov. 5th. Church Lighting, by MR. W. T. F. SOUTER.

Dec. 3rd. Short Cuts in Illuminating Engineering—Latest Developments, by MR. W. J. G. DAVEY.

1947.

Jan. 14th. Stage Lighting, by MR. R. GILLESPIE WILLIAMS.

Feb. 4th. The Analytical Approach to Industrial Seeing, by MR. W. IMRIE SMITH.

Mar. 4th. Light by Fluorescence, by DR. G. O. STEVENS.

April 1st. Glass in the Service of Light, by DR. A. J. HOLLAND.

April 29th. Annual General Meeting to be followed by a Lecture. (Subject to be announced later.)

TEES-SIDE GROUP [NORTH EASTERN AREA]

(*Hon. Secretary:* R. H. BATEY, 14, Preen Drive, Ackham, Middlesbrough.)

Meetings will be held in the Cleveland Scientific and Technical Institution, Corporation Road, Middlesbrough, at **6 p.m.**

[To be announced.]

THE LIBRARY

Introductory.

The library at 32, Victoria-street, has been enlarged by the addition of a number of valuable books since the publication of the last complete list in the Transactions for April, 1939. A revised and up-to-date list is given in the following pages.

The library is open for inspection, but notice of visits is, however, expedient with a view to avoiding times during which the room is in use for committees, etc.

Conditions of Borrowing.

Books may now be borrowed on application at 32, Victoria-street, a record of the title and reference number of any book removed being left in the office. Books may not be kept for more than a fortnight. Certain books, which are either irreplaceable or can be replaced only with extreme difficulty or are otherwise subject to certain stipulations by the donor, cannot, however, be removed from the library, but are open for inspection only.

Acknowledgments.

It is desired to take this opportunity of thanking all those who have assisted in the formation of the library by gifts of books and otherwise. It is hoped that members of the Society responsible for books on illumination and photometry will continue to present copies to the library on publication.

Arrangement of Library.

The books are divided into twenty-three groups on the shelves, as follows:

1. Illumination and Equipment. (General.)
2. Industrial Lighting. (Including Mines.)
3. Architectural Lighting.
4. Public and Street Lighting.
5. Sign and Advertisement Lighting.
6. Stage and Studio Lighting. (Cine and Still.)
7. Floodlighting.
8. Signals and Beacons.
9. Projection.
10. Daylight.
11. Light Sources. (Gas, Electric, and Others.)
12. Photometry and Photoelectric Cells.
13. Physical Optics.
14. Physiological Optics.
15. Colour.
16. X-Rays, U.V. Radiation, and Spectroscopy.
17. Television.
18. Photography.
19. Gas Fitting and Supply.
20. Electric Fitting and Wiring.
21. Transactions and Research Reports.
22. Specifications and Regulations.
23. Miscellaneous.

Each book is marked with two numbers, the first indicating the group upon the shelves and the second the number of the book within that group. For example, a book marked 15/7 will be the seventh volume in the general group on "Colour."

CATALOGUE OF BOOKS.

1. Illumination and Equipment (General).

Section No.	Title.	Author.	Date.
1/ 1	Electric Lighting	Fontaine, H.	1878
1/ 2	Electric Photometry and Illumination	Bohle, H.	1925
1/ 3	Modern Illuminants and Illuminating Engineering	Gaster, L., and Dow, J. S.	1915
1/ 4	Modern Electric Illumination	Sylvester, C., and Ritchie, T. E.	1927
1/ 5	Radiation, Light, and Illumination	Steinmetz, C. P.	1909
1/ 6	Modern Lighting	Caldwell, F. C.	1930
1/ 7	Symposium on Illumination	Various	1935
1/ 8	Text-book of Illumination	Kunerth, W.	1936
1/ 9	Lighting Calculations	Higbie, H. H.	1934
1/10	Scientific Basis of Illuminating Engineering	Moon, P.	1936
1/11	Theory and Design of Illuminating Engineering Equipment	Jolley, L. B. W., Waldram, J. M., and Wilson, G. H.	1930
1/12	Illuminating Engineering	Cady and Dates	1928
1/13	Electric Illuminating Engineering	Barrows, W. E.	1908
1/14	Lichttechnik	Bloch, L.	1921
1/15	Lectures on Illuminating Engineering	Vol. I.	1911
1/16	Lectures on Illuminating Engineering	Vol. II.	1911
1/17	Art of Illumination	Bell, L.	1912
1/18	Light, Photometry, and Illumination	Barrows, W. E.	1912
1/19	The Lighting Art	Luckiesh, M.	1917
1/20	Practical Illumination	Cravath, J. R., and Lansingh, V. R.	1907
1/21	Illumination and Photometry	Wickenden, W. E.	1910
1/22	Standard Lighting	Cushing, H. C.	1922
1/23	Electric Lighting	Franklin, W. S.	1912
1/24	Illumination, its Distribution and Measurement	Trotter, A. P.	1911
1/25	The Science of Illumination	Bloch, L.	1912
1/26	Elements of Illuminating Engineering	Trotter, A. P.	1921
1/27	Scientific Illumination	Macbeth, Evans, and Co.	1911
1/28	Modern Electric Illumination	Horstman, H. C., and Tousley, V. H.	1916
1/29	High Efficiency Electric Illuminants and Illumination	Hutchinson, R. W.	1910
1/30	Practical Treatise on Electric Lighting	Gordon, J. E. H.	1884
1/31	Electric Light	Urquhart, J.. W.	1880
1/32	Illumination and Artificial Lighting	Blok, A.	1914
1/33	Light, Radiation, and Illumination	Högner, P.	1913
1/34	Private House Lighting	Taylor, F. H.	1930
1/35	Electric Lighting	Preece, W. H.	1883
1/36	Light in Daily Life	Dow, J. S.	1939
1/37	Electric Illumination, Vol. I.	Various	1882-1884
1/38	Electric Illumination, Vol. II.	Various	1882-1884
1/39	Leuchttechnik	Lummer, O.	1917
1/40	Light, Photometry, and Illuminating Engineering	Barrows, W. E.	1938
1/41	Library Buildings—Heating and Lighting	Hilton-Smith, R. D.	1933

Section No.	Title.	Author.	Date.
1/42	The Gates of Light	Irwin, Beatrice	1930
1/43	L'Eclairage à Paris	Marechal, H.	1894
1/44	Lighting the Home	Read, A. B.	1938
1/45	Public Library Lighting, Vol. I.	Hilton-Smith, R. D.	1937
1/46	Public Library Lighting, Vol. II., Part 1	Hilton-Smith, R. D.	1938
1/47	*To come*		
1/48	Practical Electric Illumination and Signal-Wiring Methods	Croft, T.	1939
1/49	Vocabulary of Terms connected with Illuminating Engineering	Edited by the Secretary of the Dutch National Committee on Illumination	1940
1/50	Artificial Light and its Application in the Home	Prepared by the I.E.S. (U. S. A.)	1932
1/51	Modern Factory Lighting	Issued by the B.E.D.A. and E.L.M.A.	1940
1/52	The Heating, Ventilation and Lighting of School Buildings	Seymour, W. D.	1939
1/53	Lighting and Public Health	Clark, J. H.	1924
1/54	Arc Lamps	Eck, J.	1910
1/55	The Electric Light in Our Homes	Hammond, R.	1884
1/56	Artificial Light	Luckiesh, M.	1920
1/57	Torch of Civilisation	Luckiesh, M.	1940
1/58	Lighting Fixtures and Lighting Effects	Luckiesh, M.	1925
1/59	Light and Work	Luckiesh, M.	1924
1/60	A Guide to Heating, Ventilating and Lighting	Seymour, W. D.	1944
1/61	Light and Health	Luckiesh, M., and Pacini, A. J.	1926

2. Industrial Lighting.

2/ 1	Factory Lighting	Clewell, C. E.	1913
2/ 2	Omnibus Lighting and Starting	Houghton, J. W.	1929
2/ 3	Works Lighting	Ogley, D. H.	—
2/ 4	Electric Train Lighting	Coppock, C.	1931
2/ 5	Electric Shop Window Lighting	Fletcher, G. K.	1921
2/ 6	Mine Lighting	Whittaker, J. W.	1928
2/ 7	Industrial Lighting	Benjamin Electric Company	1928
2/ 8	Train Lighting—Leitner System	Leitner, H.	1907
2/ 9	Die Beleuchtung von Eisenbahn Personenwagen	Büttner, M.	1912
2/10	Shop Window Lighting	Anon.	1933
2/11	Modern Industrial Lighting	Hughes, G. B.	1943

3. Architectural Lighting.

3/ 1	Electricity for Architects	Waghorn, C. H.	1930
3/ 2	Lighting from Concealed Sources	Stair, J. L.	1919
3/ 3	Modern Cinemas	Various	1936

4. Public and Street Lighting.

4/ 1	Public Lighting with Gas and Electricity	Dibdin, W. J.	1902
4/ 2	Electric Street Lighting	Stahl, C. J.	1929
4/ 3	Street Lighting Practice	Harrison, W., Haas, O. F., and Reed, K. M.	1930
4/ 4	Beleuchtung von Städte und Ortschaften	Strache, H.	1914

5. Sign and Advertisement Lighting.

Section No.	Title.	Author.	Date.
5/ 1	Neon Tube Practice	Schallreuter, W. L.	1933
5/ 2	Neon	Gold, S.	1934
5/ 3	Neon Signs	Miller, S. C., and Fink, D. G.	1935
5/ 4	Neon Tube Practice (2nd Edition)	Schallreuter, W. L.	1938

6. Stage and Studio Lighting.

6/ 1	Stage Lighting	Ridge, C. H., and Aldred, F. S.	1935
6/ 2	Stage Lighting	Ridge, C. H.	1928
6/ 3	Studio Portrait Lighting	Lambert, H.	1930
6/ 4	Lighting for Little Theatres	Ridge, C. H.	1925

7. Floodlighting.

[*Reserved for future publications.*]

8. Signals and Beacons.

8/ 1	Lighthouse Construction and Illumination	Stevenson, T.	1880
8/ 2	Proceedings of International Conference on Lighthouses		1933
8/ 3	Automatic Street Traffic Lighting	Harrison, H. H., and Priest, T. P.	1934
8/ 4	Phares et Signaux Maritimes	Ribière, G.	1929

9. Projection.

9/ 1	Range of Electric Searchlight Projectors	Rey, J.	1917
9/ 2	Modern Picture Theatre Projection Equipment	Johnson, R. V.	1925
9/ 3	Modern Bioscope Operator		1911
9/ 4	Cinema Operators' Handbook	Ibbertson, W. S.	1921

10. Daylight.

10/ 1	Easements of Light, Vol. I.	Swarbrick, J.	1929
10/ 2	Easements of Light, Vol. II.	Swarbrick, J.	1929

11. Light Sources.

11/ 1	Development of the Incandescent Lamp	Barham, G. B.	1912
11/ 2			
11/ 3	Arc and Glow Lamps	Maier, J.	1886
11/ 4	Incandescent Electric Lamps	Ogley, D. H.	1914
11/ 5	Lighting by Acetylene	Dye, F.	1902
11/ 6	Petrol Air Gas	O'Connor, H.	1912
11/ 7	Guide Pratique à Usager de Acetylene		1910
11/ 8	The Arc	Ayrton, H.	1902
11/ 9	From the Beginning	Loring, H.	1912
11/10	Projector Carbons	National Carbon Co.	1935
11/11	Incandescent Lighting	Levy, S. I.	1922
11/12	Electric Lamps	Solomon, B.	1908
11/13	Electrisches Bogenlicht	Birrenbach, H.	1903
11/14	Electrisches Gasenladungslampen	Uyterhoeven, W.	1938
11/15	Story of the Lamp	Bobbins, F. W.	1939
11/16	Fluorescent Lighting Manual	Amick, C. L.	1942
11/17	Fluorescent Lighting	Atkinson, A. D. S.	1944
11/18	Electric Discharge Lamps	Cotton, H.	1946
11/19	Luminous Tube Lighting	Miller H. A.	1945

12. Photometry and Photoelectric Cells.

Section No.	Title.	Author.	Date.
12/ 1	Essai D'Optique	Bouguer, M.	1729
12/ 2	Photometria	Lambert, I. H.	1740
12/ 3	Treatise on Photometry	Palaz, A.	1894
12/ 4	Photometrie Industrielle	Palaz, A.	1892
12/ 5	Praktische Photometrie	Liebenthal, E.	1907
12/ 6	Photometry	Trotter, A. P.	1884
12/ 7	Practical Photometry	Dibdin, W. J.	1889
12/ 8	Photometric Measurements	Stine, W. M.	1900
12/ 9	Elementary Principles of Lighting and Photometry	Walsh, J. W. T.	1923
12/10	Photometry	Walsh, J. W. T.	1926
12/11	The Selenium Cell	Barnard, G. P.	1930
12/12	Photoelectric Cells	Campbell, N. P., and Ritchie, D.	1934
12/13	Lehrbuch der Photometrie	Uppenborn, F., and Monash, B.	1913
12/14	Photo-electric and Selenium Cells	Fielding, T. J.	1940

13. Physical Optics.

13/ 1	Traité D'Optique	Bouguer, M.	1740
13/ 2	Treatise on Optics	Griffin, W. N.	1842
13/ 3	Optics	Parkinson, S.	1870
13/ 4	Wave Theory of Light	Lloyd, H.	1873
13/ 5	Optics and Light	Lommel, E.	1880
13/ 6	Light	Wright, L.	1882
13/ 7	Physical Optics	Basset, A. B.	1892
13/ 8	On Light	Stokes, G. G.	1892
13/ 9	The Theory of Light	Preston, T.	1895
13/10	Light, Visible and Invisible	Thompson, S. P.	1910
13/11	Treatise on Practical Light	Clay, R.	1911
13/12	Treatise on Light	Huyghens (Trans.)	1912
13/13	Physical Optics	Wood, R. W.	1914
13/14	Treatise on Light	Houstoun, R. A.	1915
13/15	Practical Optics	Johnson, B. K.	1922
13/16	Geometrical Optics	Percival, A. S.	1913
13/17	Simplified Method of Tracing Rays through any Optical System	Silberstein, L.	1918
13/18	Textbook of Light	Stewart, R. W., and Satterley, J.	1941
13/19	The Universe of Light	Bragg, W.	1933
13/20	Mechanism of Nature	Andrade, E. N. da C.	1930

14. Physiological Optics.

14/ 1	Ophthalmic Science and Practice	Juler, H. E.	1884
14/ 2	Colour Blindness	Edridge-Green, F. W.	1909
14/ 3	Physiological Optics	Burch, G. J.	1912
14/ 4	Year Book of the British Optical Society		1914
14/ 5	Reading as a Visual Task	Luckiesh, M., and Moss, F. K.	1942
14/ 6	Seeing	Luckiesh, M., and Moss, F. K.	1931
14/ 7	Science of Seeing	Luckiesh, M., and Moss, F. K.	1937
14/ 8	School Vision	Kerr, J.	1925
14/ 9	Light, Vision and Seeing	Luckiesh, M.	1944
14/10	Proceedings of the Optical Society, Part I.		1926
14/11	Proceedings of the Optical Society, Part II.		1926
14/12	Proceedings of the Optical Convention. Vol. II.		1912
14/13	Vision—Discussion on		1932
14/14	Seeing and Human Welfare	Luckiesh, M.	1934

Section No.	Title.	Author.	Date.
14/15	—	—	—
14/16	Fatigue de l'Appareil Visuel.....	Stassen, M.	1919
14/17	Year Book of British Optical Society	.....	1927
14/18	Physiological Optics, Vol. I.....	Helmholz, H.	1924
14/19	Physiological Optics, Vol. II.	Helmholz, H.	1924
14/20	Physiological Optics, Vol. III. ...	Helmholz, H.	1924
14/21	Miners' Nystagmus	Llewellyn, T. L.	1912
14/22	The Perception of Light	Wright, W. D.	1938

15. Colour.

15/ 1	Colour Measurement and Mixture	Abney, W.	1881
15/ 2	Colour	Church, M. A.	1887
15/ 3	Modern Chromatics.....	Rood, O. N.	1879
15/ 4	Colour Phenomena	Lovibond, J. W.	1905
15/ 5	Light and Colour	Houstoun, R. A.	1923
15/ 6	Colour and its Applications	Luckiesh, M.	1915
15/ 7	Colour Vision.....	Abney, W.....	1895
15/ 8	Researches in Colour Vision	Abney, W.....	1913
15/ 9	Light and Colour Theories	Lovibond, J. W.	1921
15/10	Coloured Light	Klein, A. B.	1937
15/11	Colour Vision	Parsons, J. H.	1924
15/12	Repertoire des Couleurs	.....	1912
15/13	Colour and Colour Reproduction	Martin, L. C., andGamble, W.	1923
15/14	Color and Colors	Luckiesh, M.....	1938
15/15	Horticultural Colour Chart, Part I.	British Colour Council and the Royal Horticultural Society.....	1938
15/16	Horticultural Colour Chart, Part II.	British Colour Council and the Royal Horticultural Society	1941
15/17	The Measurement of Colour	Wright, W. D.	1944

16. X-Rays, U.V. Radiation, and Spectroscopy.

16/ 1	The Spectroscope	Baker, T. T.	1923
16/ 2	X-Rays	Broglie, M. de	1925
16/ 3	Fluorescent Analysis in U.V. Light	Radley, J. A., and Grant, J.	1935
16/ 4	Fluorescence and Phosphorescence	Hirschlaff, E.	1938

17. Television.

17/ 1	A.B.C. of Television	Yates, M. F.	1929
17/ 2	Television	Sheldon, H. H., and Grisewood, E. N.	1929
17/ 3	—	—	—
17/ 4	Television Optics	Myers, L. M.....	1936
17/ 5	Television To-day and To-morrow	Moseley, S.A., and Chapple, H. J. B.	1930

18. Photography.

18/ 1	Picture Play Photography	Lomas, H. M.	1914
18/ 2	Photographic Photometry	Dobson, G. M., Griffith, I., and Harrison, D. N.	1926
18/ 3	Infra Red Photography	Rawling, S. O.	1936
18/ 4	Theory and practice of Photography	Clerc, L. P.	1937
18/ 5	Colour Cinematography	Klein, A. B.	1937

19. Gas Fitting and Supply.

Section No.	Title.	Author.	Date.
19/ 1	Practical Gas Fitting	Grafton, W.	1907
19/ 2	Town Gas and Its Uses	Webber, W. H.	1907
19/ 3	Distribution of Gas	Hole, W.	1909
19/ 4	Gas Supply	Webber, W. H.	1914
19/ 5	Modern Gas Fitting	Phillips, S., and Tuft, G. T.	1930
19/ 6	Domestic Utilisation of Gas—I	Smith, N. S., and Le Fevre, R. N.	1932
19/ 7	Domestic Utilisation of Gas—II.	Smith, N. S., and Le Fevre, R. N.	1932
19/ 8	History of Gas Lighting	Chandler, D.	1936
19/ 9	Das Städtishe Gasrohrnetz	Brinkhaus, P.	1913
19/10	Das Gasrohrleger and Gaseinrichter	Kuckuk, F.	1909
19/11	The Gas Showroom	Wheeler, F. C.	1927
19/12	Report on the Gas Industry in Great Britain		1939
19/13	Gasometry	Bunsen, R.	1857

20. Fitting and Wiring (Electric).

20/ 1	Electric Wiring Diagrams	Maycock, W. P.	1911
20/ 2	Electric Circuits	Maycock, W. P.	1911
20/ 3	Electric Wiring	Clinton, W. C.	1913
20/ 4	Electric Circuit Theory and Calculations	Maycock, W. P.	1913
20/ 5	Electric Light Fitting	Batstone, S. C.	1914
20/ 6	Electric Estimating	Connan, J. C.	1925
20/ 7	Electric Wiring	Ibbertson, W. S.	1920
20/ 8	Electric Wiring and Contracting —Vol. I.	Various	1929
20/ 9	Electric Wiring and Contracting —Vol. II.	Various	1929
20/10	Electric Wiring and Contracting —Vol. III.	Various	1929
20/11	Electric Wiring and Contracting —Vol. IV.	Various	1929
20/12	Electric Wiring and Contracting —Vol. V.	Various	1929
20/13	Electric Wiring and Contracting —Vol. VI.	Various	1929
20/14	Electric Wiring and Contracting —Vol. VII.	Various	1929
20/15	Small Switches and their Circuits	Maycock, W. P.	1911
20/16	Practical Electric Light Fitting	Allsop, F. C.	1923
20/17	Electric Lighting and Heating [Installation]	Taylor, F. H.	1928
20/18	Electric Wiring of Buildings	Raphael, F. C.	1930
20/19	Electric Wiring	Clinton, W. C., and Freeman, E.	1928
20/20	Electric Wiring, Fittings, Switches, and Lamps	Maycock, W. P.	1917

21. Transactions and Reports (General).

21/ 1	Commission Internationale de l'Eclairage	Compte Rendu	1924
21/ 2	Vierde Internationaal Congress von Ongevallengeneeskunde		1925
21/ 3	Commission Internationale de l'Eclairage	Compte Rendu	1928
21/ 4	Proceedings of International Congress on Illumination		1928
21/ 5	Commission Internationale de l'Eclairage	Compte Rendu	1931

Section No.	Title.	Author.	Date.
21/ 6	Proceedings of International Illumination Congress—Vol. I.	.....	1931
21/ 7	Proceedings of International Illumination Congress—Vol. II.	.....	1931
21/ 8	Commission Internationale de l'Eclairage	Compte Rendu	1935
21 /9	Compte Rendu du Congrès Internationale des Appareils de l'Eclairage à Paris	.....	1937
21/14 to 21/22	Transactions of Gas Engineers...	.....	1914-28
21/23	Transactions of the Illum. Eng. Soc. (U.S.A.). Vol. I.	.....	1906
21/24	Transactions of the Illum. Eng. Soc. (U.S.A.). Vol. II.....	.....	1907
21/25 to 21/30	The Illuminating Engineer (U.S.A.)	.....	1906-12
21/35 to 21/62	The Illuminating Engineer (London).....	.....	1908-35
21/63 to 21/72	Light and Lighting.....	.....	1936-45
21/101 to 21/110	Transactions of the Illum. Eng. Soc. (London)	.....	1936-45

A considerable number of copies of the Transactions of the Illum. Eng. Soc. (U.S.A.) are also available, but these are not at present arranged to form a continuous series.

22. Specifications and Regulations.

Not yet completed. A set of B.S.I. Specifications is available.

23. Miscellaneous.

23/ 1 to 23/10	Hawkins Electrical Guide—Vols. I.-X.	.....	1917
23/11	The Telescope	Bell, L.	1922
23/12	The Microscope.....	Beck, C.....	1921
23/13	Modern Glass Practice	Scholes, S. R.	1935
23/14	Centenary Lectures—American Gas Institute	.....	1912
23/15	Faraday Centenary Exhibition Catalogue	.....	1931
23/16	Vector Algebra	Silberstein, L.	1919
23/17	Wissenschaftliche Vorträge	Helmholz, H.	1871
23/18	Electrical Technology	Cotten, H.	1932
23/19	Practical Electrician's Pocket Book	.....	1939
23/20	Glass in Architecture and Decoration	McGrath, R., and Frost, C.	1937
23/21	Worked Examples for Wiremen and Students.....	Rees	1933
23/22	The Power Factor Booklet	Amberton, R.	1934
23/23	Service Charges in Gas and Electric Rates.....	Havlik, H. F.	1938
23/24	A.B.C. Guide to Glass.....	Reynolds, G. S., and Hughes, G. P.	1939
23/25	The Place of Glass in Building...	Cloag, J.	1943
23/26	The Book of the Sky	Luckiesh, M.	1933
23/27	The Application of Radiant Heat to Metal Finishing	Nelson, J. H., and Siman, H.....	1944

Additions to List of Members

The following applicants have been duly elected by the Council to membership in the Society, and their names have been added to the list of members:—

SUSTAINING MEMBERS:—

Dearne District Electricity Board..... .....*Representative*: Mr. W. J. Raby. Electricity Offices, Goldthorpe, Nr. Rotherham, YORKS.

Midland Electric Corporation for Power Distribution, Ltd. .....*Representative*: Mr. L. Arkinstall. Toll End Road, Ocker Hill, Tipton, STAFFS.

CORPORATE MEMBERS:—

Allen F. S. .....19, Tarporley Avenue, MANCHESTER, 14.
Anderson, S. .....The General Electric Company, Ltd., Magnet House, KINGSWAY, W.C.2.
Banks, R. V. ....."Hillcrest," Lord Romney Hill, Maidstone, KENT.
Beard, D. E. ....."Fair View," Stoke St. Michael, Bath, SOMERSET.
Bell, C. D. T. .....58, Crystal Palace Park Road, Sydenham, LONDON, S.E.26.
Bradley, T. H. .....44, Eastbourne Grove, Heaton, Bolton, LANCS.
Burgess, D. W. .....25, Gladstone Road, Farnborough, KENT.
Butten, E. E. .....Personal Administration, 55, S. Audley Street, W.1.
Cain, A. L. .....113, Melbourn Road, Royston, HERTS.
Carrington, J. B. ....94, Sharmans Cross Road, Solihull, WARWICKSHIRE.
Chambers, E. A. ....."Milverton," Bradford Road, Combe Down, BATH.
Cooper, W. A. .....27, Cwrt-y-vil Road, Penarth, GLAM.
Davis, O. H. .....85, Lavender Hill, Battersea, LONDON, S.W.11
Dick, H. .....87, Crawford Road, SHEFFIELD, 8.
Dourgnon, J. .....5, rue Jean Mermoz, Paris VIII., FRANCE.
Figgis, P. D. .....Lighting Section, The British Thomson-Houston Co., Ltd., Bridle Path, Watford, HERTS.
Freeman, J. R. .....Lyde House, Compton Greenfield, GLOS.
Gaughan, M. .....74, Wychwood Avenue, Edgware, MIDDLESEX.
Gray, J. .....18, Harehills Park Avenue, LEEDS, 9.
Hampton, F. .....10, Heene Terrace, Worthing, SUSSEX.
Harrison-Jones, E. R. 30, Vera Avenue, Grange Park, N.21.
Holmes, T. .....13, Denham Road, Epsom, SURREY.
Hornsby, E. H. .....42, Braeside, Beckenham, KENT.
Hudson, K. W. .....East Hull Gas Company, St. Mark Street, HULL.
Johnson, L. ....."Woodcot," Field Road, Charlwood, SURREY.
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